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U.S. Patent Application Serial No. 10/82/1092
Filed: April 19, 2004, Inventor: Junes Wigner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404,915,6494
Artorney Docket No. 14088/299978
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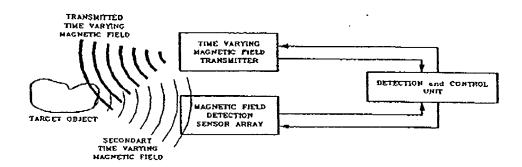


FIGURE 1-1 SYSTEM BLOCK DIAGRAM

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U.S. Patent Application Senai No. 10/327/089
Filed: April 19, 2004, Inventor: James Wagner Largen
For: Systems and Methods Useful For Detecting Prepence
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Attorney: James L. Ewing, IV, Telephone: 404.815.6494.
Attorney: Docket No. 14088/299978
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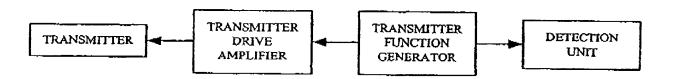


FIGURE 1-2 TRANSMITTER WITH KNOWN OUTPUT FUNCTION

Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
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Attorney: James L. Ewing, IV, Telephone: 404.815.6494
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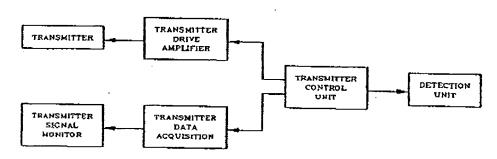


FIGURE 1-3
TRANSMITTER WITH MAGNETIC FIELD MONITOR

U.S. Patent Appheation Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
Por: Systems and Methods Useful For Detecting Presence
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Attorney: James L. Bwing, IV, Telephons: 404,815,6494
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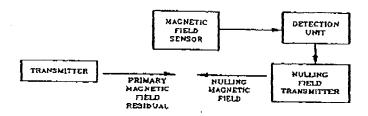


FIGURE 1-4A RESIDUAL MAGNETIC FIELD NULLING USING A NULLING MAGNETIC FIELD

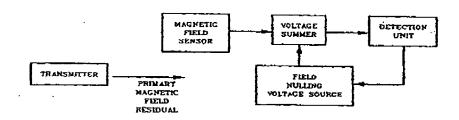


FIGURE 1-4B VOLTAGE NULLING OF RESIDUAL FIELD SENSOR OUTPUT

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larstn
For: Systems and Methods Useful For Detecting Presence
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Attorney: James L. Ewing, IV. Telephone: 404.815.6494
Attorney Docket No. 14088/299978
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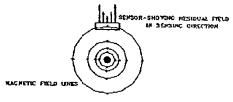


FIGURE 1-5A
TRANSMITTER COIL CROSS SECTION FOR SINGLE WIRE COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

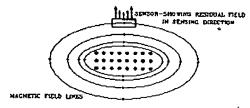


FIGURE 1-5B
TRANSMITTER COIL CROSS SECTION FOR NORMAL RECTANGULAR COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

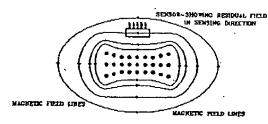


FIGURE 1-5C
TRANSMITTER COIL CROSS SECTION FOR SHAPED COIL SHOWING SENSOR POSITION AND RESIDUAL FIELD

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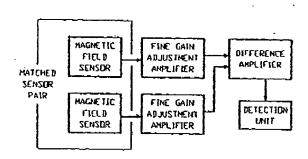


FIGURE 1-6
GRADIENT SENSING USING A MATCHED SENSOR PAIR

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004. Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detocting Presence.
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Attorney Docket No. 14088/299978
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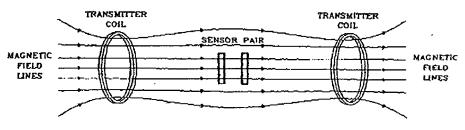


FIGURE 1-7
SENSOR PAIR CALIBRATION
USING TWO TRANSMITTER EQUAL COILS

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U.S. PERCENT Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Syrtems and Methods Useful Pur Detecting Presence
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Attorney: James L. Ewing, IV, Telephone: 404.815,6494
Attorney Docker No. 14088/299978
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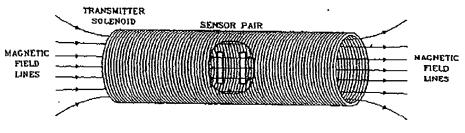


FIGURE 1-8 SENSOR PAIR CALIBRATION USING A LARGE SOLENOID COIL

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
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Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Attorney Docket No. 14088/299978
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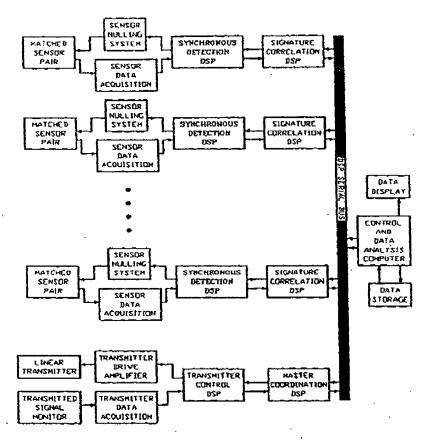
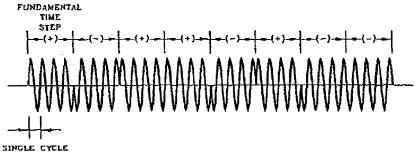


FIGURE 1-9
SYSTEM WITH MULTIPLE SENSOR PAIRS
AND SYNCHRONOUS DETECTION
BASED ON DSP PROCESSORS

1.3

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Joventon: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
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Antorney: Docket No. 14083/299978
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SINGLE CYCLE
HOTE: AN INTEGER NUMBER OF CYCLES PER TIME STEP (4 IN THIS PATTERN)

FIGURE 1-10
AN 8 SECTION (+ - + + - + - -)
TIME ENCODED WAVEFORM

U.S. Patont Application Serial No. 10/827,089

Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence.
And/or Location Of Various Materials
Automory: James L. Ewing, IV, Telephone: 404.815.6494
Automory Docket No. 14088/299978
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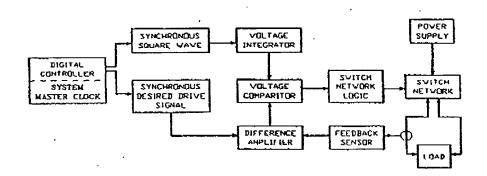
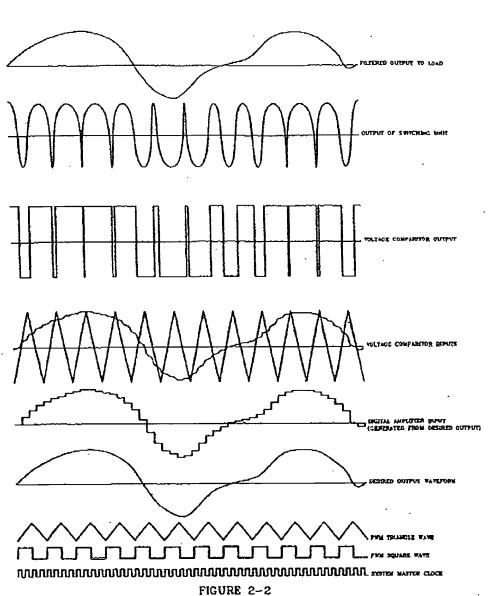


FIGURE 2-1 SYNCHRONOUS PULSE WIDTH MODULATION AMPLIFIER

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Luyen
For: Systems and Methods Useful For Detecting Presence.
And/Ox Location Of Various Materials
Antonney: James L. Ewing, IV, Telephone: 404.815.6494
Attorney: Docket No. 14088/299978
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TYPICAL PULSE WIDTH MODULATION WAVEFORMS

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U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV. Telephone: 404.815.6494
Attorney Docket No. 14038/299978
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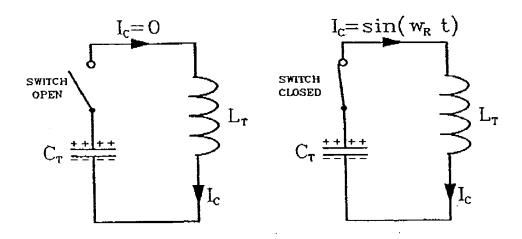


FIGURE 4-1 WHEN SWITCH IS CLOSED CIRCUIT OSCILLATES AT RESONANT FREQUENCY, WR

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Amorney: James L. Ewing, IV, Telephone: 404.815,6494
Attorney Docket No. 14088/259978
REPLACEMENT DRAWING

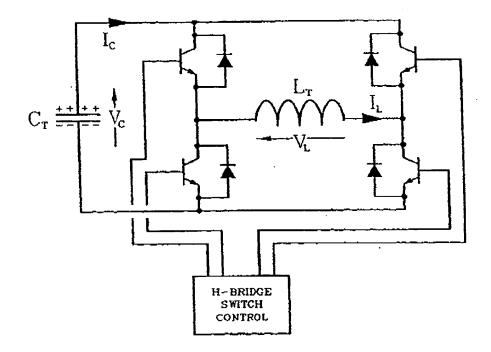


FIGURE 4-2
AN H-BRIDGE SWITCH NETWORK
CONNECTINT THE CHARGED CAPACITOR
TO THE LOAD COIL

U.S. Parent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsep
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attomey: James L. Ewing, JV, Telephone: 404.815.6494
Attorney: Darks L. Ewing, JV, Telephone: 404.815.6494
Attorney: Docket No. 14088/299978
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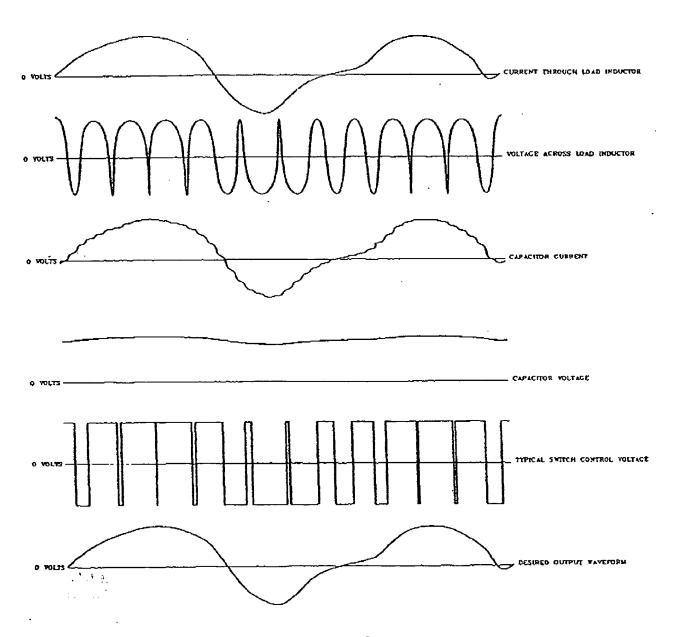


FIGURE 4-3
SWITCHED CAPACITOR CIRCUIT WAVEFORMS

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U.S. Patent Application Serial No. 10827,089
Filod: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Antorney: James L. Ewing, IV, Telephonet: 404.815,6494
Attorney Docket No. 14088/299978
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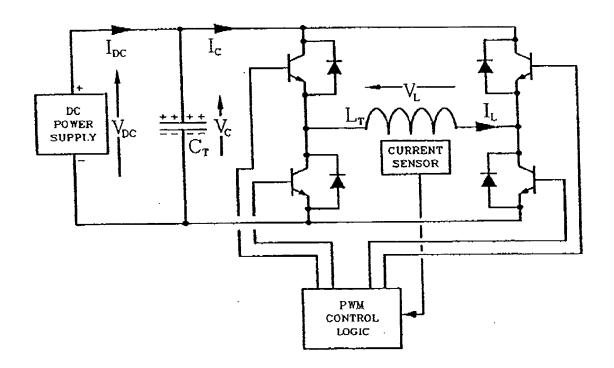


FIGURE 4-4
PULSE WIDTH MODULATED
SWITCHED CAPACITOR RESONATOR

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U.S. Pstent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Largen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815,6494
Attorney: Dacket No. 14088/299978
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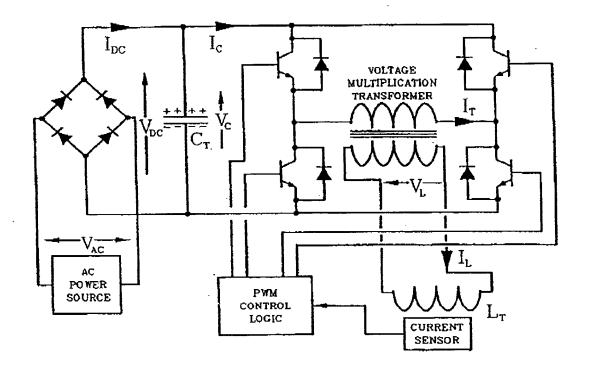


FIGURE 4-5 SWITCHED CAPACITOR RESONATOR WITH INTEGRAL SWITCHING POWER SUPPLY

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U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagnet Larsen
For: Systems and Methods Useful For Detecting Presence
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Attorney: James L. Ewing, IV. Telephone: 404.815.6494
Antorney: Docket No. 14088/299978
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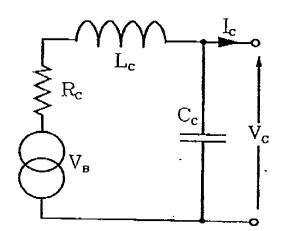


FIGURE 5-1 SENSE COIL EQUIVALENT CIRCUIT

KILPATRICK_
U.S. Patent Application Serial No. 10827,059
Filed: April 19, 2004, Jeventor: James Wagner Larsen
For: Systems and Methods Useful Por Detecting Presence
And/Or Location Of Various Materials
Attorney: James L Ewing, IV. Telephono: 404.815,6494
Attorney Docket No. 14088/299978
REPLACEMENT DRAWING

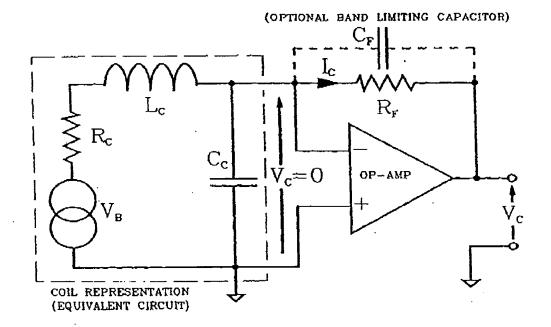


FIGURE 5-2
OPERATIONAL AMPLIFIER BASED
VOLTAGE TO CURRENT CONVERSION CIRCUIT

A: 15

U.S. Patent Application Serial No. 10727,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presented
And/Or Location Of Various Materials
Attorney: Junes I. Ewing, IV, Telephone: 404.815.6494
Amorrey Docket No. 14088/299978
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SENSITIVITY FOR #32 WIRE WITH Rf+10MOhm

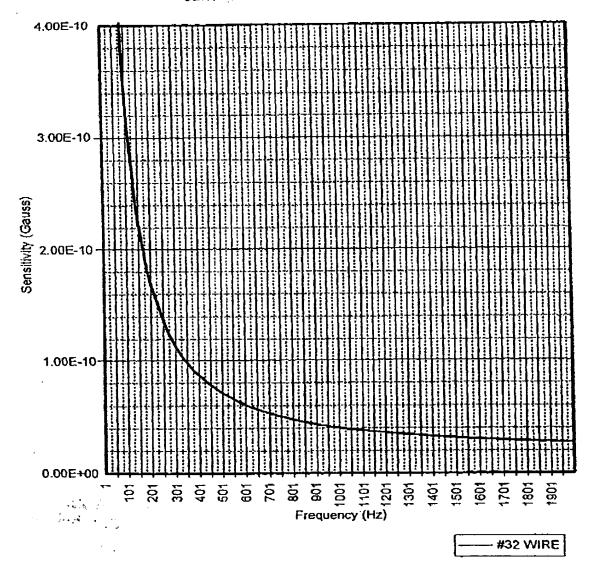
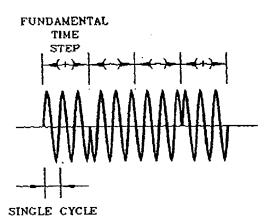


FIGURE 5-3

4048156118

U.S. Patent Application Serial No. 10/827,039
Filed: April 19, 2004, Inventor: James Wagner Largen
For: Systems and Methods Useful For Detecting Presence:
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Altiorusy: Junes L. Ewing, IV, Telephone: 404.815.6494
Actorney Docket No. 14088/299978
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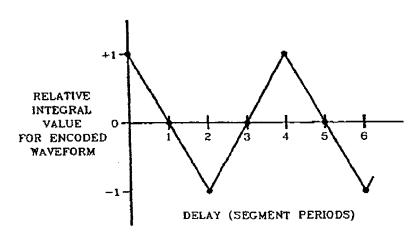


NOTE: AN INTEGER NUMBER OF CYCLES PER TIME STEP (3 IN THIS PATTERN)

FIGURE 6-1 A 4 SEGMENT (+ - - +)TIME ENCODED WAVEFORM

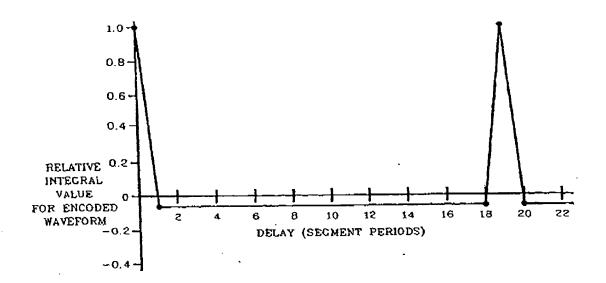
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U.S. Patent Application Serial No. 10/827,039
Filed: April 19, 2004. Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presenge
And/Or Location Of Various Materials
Attorney: James L. Swing, IV., Telephone: 404.813.6494
Attorney Docket No. 14088/299978
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS ZERO

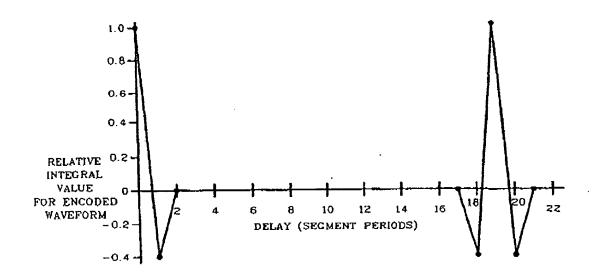
FIGURE 6-2 CORRELATION OF THE 4 SEGMENT (+ - - +) ENCODED WAVEFORM WITH ITSELF U.S. Patent Application Serial No. 10/827,089
Fibed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
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Attorney; James L. Ewing, IV, Telephone: 404.815.6494
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS 0.0526

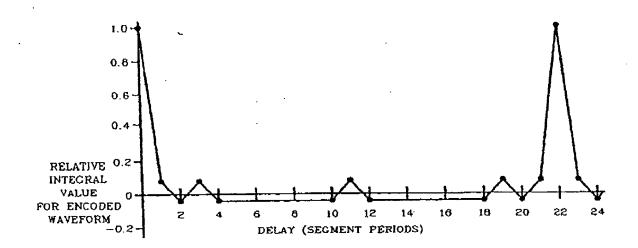
FIGURE 6-3
CORRELATION OF THE 19 SEGMENT
(++++--++-+--)
ENCODED WAVEFORM WITH ITSELF

U.S. Patent Application Serial No. 10/827,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS -0.1

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Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence:
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Attorney: James L. Ewing, IV. Telephone: 404,315,6494
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS ZERO

3 3 1 1 .

U.S. Patent Application Serial No. 10/527,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
Fer: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Autorney Docket No. 14088/299978
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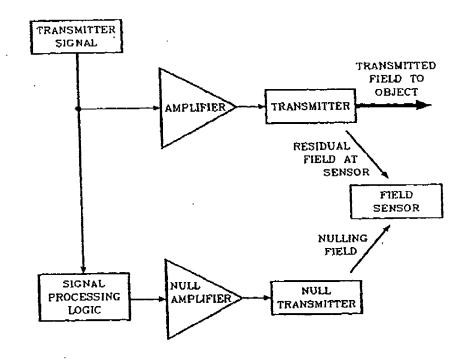


FIGURE 7-1 LOCAL MAGNETIC FIELD GENERATION FOR RESIDUAL FIELD CANCELLATION

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